

## CLAIMS

What is claimed is:

- 5 1. In a removable media disk drive having a harmonic disturbance induced by rotation of the media, reading means for reading a signal from the rotating media, a phase-locked loop connected to the reading means, the phase-locked loop recovering a reference signal from a signal on the media, and a harmonic corrector for reducing the effects of the harmonic disturbance on the phase-locked loop.
- 10 2. The apparatus of Claim 1 where the phase error in the phase locked loop is detected with a mixer.
- 3 The apparatus of Claim 1 where the phase error in the phase locked loop is  
15 detected with a phase detector.
4. The apparatus of Claim 1 where the phase-locked loop is a harmonic locking loop.
- 20 5. The apparatus of Claim 1 where the phase-locked loop is a Costas loop.
6. The apparatus of Claim 1 where the harmonic corrector is applied to the phase-locked loop continuously.
- 25 7. The apparatus of Claim 1 where the harmonic corrector is applied to the phase-locked loop once a predetermined set of loop conditions have been met.
8. The apparatus of Claim 1 where the harmonic corrector removes the harmonic disturbance from the phase-locked loop.
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9. The apparatus of Claim 1 where the harmonic corrector causes the phase-locked loop to track the harmonic disturbance.
10. The apparatus of Claim 8 where the harmonic corrector is a filter connected  
5 between the reading means and the phase-locked loop, reducing the harmonic disturbance passed to the phase-locked loop.
11. The apparatus of Claim 9 where the harmonic corrector is a resonant filter increasing the loop gain of the phase-locked loop at the harmonic disturbance.  
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12. The apparatus of Claim 9 where the harmonic corrector is an integrating pole added to the phase locked loop.
13. The apparatus of Claim 9 where the harmonic corrector is a feedforward  
15 corrector.
14. The apparatus of Claim 9 where the harmonic corrector is a repetitive controller.
15. The apparatus of Claim 13 where the feedforward corrector comprises means for  
20 generating a sinusoid at a phase and frequency so as to cancel the harmonic disturbance.
16. The apparatus of Claim 14 where the feedforward corrector comprises:  
means for collecting residual errors from the harmonic disturbance on one or  
more rotations of the media,  
25 means for filtering the residual errors, and  
means for feeding forward the filtered residual errors.
17. In a removable media disk drive having a harmonic disturbance induced by  
rotation of the media, reading means for reading a signal from the rotating media, a  
30 phase-locked loop connected to the reading means, the phase-locked loop recovering a reference signal from a signal on the media, the method of reducing the effects of the

harmonic disturbance on the phase-locked loop comprising applying harmonic correction to the phase-locked loop.

18. The method of Claim 17 where harmonic correction is applied to the phase locked  
5 loop continuously.

19. The method of Claim 17 where harmonic correction to the phase-locked loop is switched in and out.

10 20. The method of Claim 17 where the method of applying harmonic correction to the phase-locked loop comprises filtering the signal between the reading means and the phase-locked loop, reducing the harmonic disturbance passed to the phase-locked loop.

21. The method of Claim 17 where the method of applying harmonic correction to the  
15 phase-locked loop comprises adding a resonant filter to the phase locked loop, the resonant filter increasing the loop gain of the phase-locked loop at the harmonic disturbance.

22. The method of Claim 17 where the method of applying harmonic correction to the  
20 phase-locked loop comprises:  
generating a sinusoid at the same phase and frequency as the harmonic disturbance, and  
feeding forward the generated sinusoid so as to cancel the harmonic disturbance.

25 23. The method of Claim 17 where the method of applying harmonic correction to the phase-locked loop comprises:  
collecting residual errors from the harmonic disturbance over one or more rotations of the media,  
filtering the residual errors, and  
30 feeding forward the filtered residual errors.

24. The method of Claim 17 where the loop is a harmonic locking loop.

25. The method of Claim 17 where the loop is a Costas loop.

5 26. The method of Claim 17 where the phase error in the phase locked loop is detected with a mixer.

27. The method of Claim 17 where the phase error in the phase locked loop is detected with a phase detector.

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